1. An apparatus, for measuring concentration, distribution and flow of solids suspended in a flowing liquid, which comprises:

a transmitter emitting at least one directional beam of an acoustical waveform;

at least one detector receiving echo signals of said waveform backscattered from said solids;

means for gathering measured intensity value of said echo signals;

means for measuring Doppler frequency shifts of said echo signals; and

data processing equipment comprising means for translating said intensity values into concentration values of said solids, and means for interpreting said frequency shifts into flow measurements of said solids.

2. The apparatus of Claim 1, wherein said flowing liquid is contained in a conduit having a directional flow, and said transmitter and detector are located inside said conduit.

3. The apparatus of Claim 2, wherein said transmitter emits at least a first pair of said beams from substantially the same location, a second beam in said pair being aimed downstream from a first beam and at a longitudinal angle from said first beam.

4. The apparatus of Claim 3 which further comprises a

second of said pair of beams aimed at a transversal angle from said first pair of beams.

5. The apparatus of Claim 1 which further comprises means for generating samplings of said echo signals corresponding to discrete volumes of said liquid distributed along said beam.

6. The apparatus of Claim 5, wherein said means for translating comprises means for calibrating said intensity values by imputing site specific environmental information.

7. The apparatus of Claim 5, wherein said means for translating further comprises means for entering suspended solids concentration values obtained from a previous measurement.

8. The apparatus of Claim 6, wherein said site specific environmental information comprises water temperature, salinity and acoustical system constants, and an echo signal assignment ratio between concentration and particle size.

9. The apparatus of Claim 6, wherein said data processing equipment further comprises program means for adjusing at least one calibration parameter in translating intensity value from one of said volumes using values obtained from another volume along the same beam.

10. The apparatus of Claim 6, wherein said means for calibrating comprises means for automatically entering information, and means for manually entering information.

11. The apparatus of Claim 5, wherein said means for translating comprise means for computing a mass concentration of solid $M_{(r)}$ per unit volume at a range r according to the formula:

$$\mathrm{Log}_{10}M_{(r)}=K_s+S[dB+2r(a_w+a_s)]$$

wherein K_s is a site and instrument constant,

S is a relative backscattered coefficient defining the relationship between solid concentration and particle size,

dB is the measured relative backscattered intensity,

a_w is a water attentuation coefficient, and

a_s is an attenuation coefficient due to the presence of solids.

12. The apparatus of Claim 11, wherein said means for translating further comprise:

means for using M_r values obtained in connection with one of said volumes to compute said attenuation coefficient a_s; and

means for imputing said a_s value in translating said intensity value into an M(r) value for the next of said volume farther away from said transmitter.

13. The apparatus of Claim 4 which further comprises means for generating samplings of said echo signals corresponding to discrete volumes of said liquid distributed along said beams.

14. The apparatus of Claim 13, wherein said means for translating comprises means for calibrating said intensity values by imputing site specific environmental information.

15. The apparatus of Claim 13, wherein said means for translating further comprises means for entering concentration values obtained from a previous measurement.

16. The apparatus of Claim 15, wherein said site specific environmental information comprises water temperature, salinity and acoustical system constants, and echo signal assignment ratio between concentration and particle size.

17. The apparatus of Claim 14, wherein said data processing equipment further comprises program means for adjusing at least one calibration parameter in translating intensity value from one of said volumes using values obtained from another volume along the same beam.

18. The apparatus of Claim 14, wherein said means for calibrating comprises means for automatically entering information, and means for manually entering information.

19. The apparatus of Claim 13, wherein said means for translating comprise means for computing a mass concentration of solid $M_{(r)}$ per unit volume at a range r according to the formula:

$$\text{Log}_{10}M_{(r)}=K_s+S[dB+2r(a_w+a_s)]$$

wherein K_s is a site and instrument constant,

S is a relative backscattered coefficient defining the relationship between solid concentration and particle size,

dB is the measured relative backscattered intensity,

a_w is a water attentuation coefficient, and

a_s is an attenuation coefficient due to the presence of solids.

20. The apparatus of Claim 13, wherein said means for translating further comprise:

means for using M_r values obtained in connection with one of said volumes to compute said attenuation coefficient a_s; and

means for imputing said a_s value in translating said intensity value into an M(r) value for the next of said volume farther away from said transmitter.

21. A method for measuring concentration, distribution and flow of solids suspended in a flowing liquid, which comprises:

emitting at least one directional beam of an acoustical

waveform across said liquid;

detector receiving echo signals of said waveform backscattered from said solids;

gathering measured intensity value of said echo signals;

measuring Doppler frequency shifts of said echo signals; and

translating said intensity values into concentration values of said solids; and

interpreting said frequency shifts into flow measurements of said solids.

22. The method of Claim 21, wherein said flowing liquid is contained in a conduit having a directional flow, and said transmitter and detector are located inside said conduit.

23. The method of Claim 22, wherein said emitting comprises transmitting at least a first pair of said beams from substantially the same location, a second beam in said pair being aimed downstream from a first beam and at a longitudinal angle from said first beam.

24. The method of Claim 23 which further comprises emitting a second of said pair of beams aimed at a transversal angle from said first pair of beams.

25. The method of Claim 21 which further comprises

generating samplings of said echo signals corresponding to discrete volumes of said liquid distributed along said beam.

26. The method of Claim 25, wherein said translating comprises calibrating said intensity values by imputing site specific environmental information.

27. The method of Claim 25, wherein said translating further comprises entering suspended solids concentration values obtained from a previous measurement.

28. The method of Claim 27, wherein said site specific environmental information comprises water temperature, salinity and acoustical system constants, and echo signal assignment ratio between concentration and particle size.

29. The method of Claim 26 which further comprises adjusing at least one calibration parameter in translating intensity value from one of said volumes using values obtained from another volume along the same beam.

30. The method of Claim 26, wherein said calibrating comprises automatically entering information, and manually entering information.

31. The method of Claim 25, wherein said translating comprise computing a mass concentration of solid $M_{(r)}$ per

unit volume at a range r according to the formula:

$$Log_{10}M_{(r)}=K_s+S[dB+2r(a_w+a_s)]$$

wherein K_s is a site and instrument constant,

S is a relative backscattered coefficient defining the relationship between solid concentration and particle size,

dB is the measured relative backscattered intensity,

a_w is a water attentuation coefficient, and

a_s is an attenuation coefficient due to the presence of solids.

32. The method of Claim 31, wherein said translating further comprise:

using M_r values obtained in connection with one of said volumes to compute said attenuation coefficient a_s; and

imputing said a_s value in translating said intensity value into an M(r) value for the next of said volume farther away from said transmitter.

33. The method of Claim 24 which further comprises samplings of said echo signals corresponding to discrete volumes of said liquid distributed along said beams.

34. The method of Claim 33, wherein said translating comprises calibrating said intensity values by imputing site specific environmental information.

35. The method of Claim 33, wherein said translating

further comprises entering concentration values obtained from a previous measurement.

36. The method of Claim 35, wherein said site specific environmental information comprises water temperature, salinity and acoustical system constants, and echo signal assignment ratio between concentration and particle size.

37. The method of Claim 34, wherein said data processing equipment further comprises program adjusing at least one calibration parameter in translating intensity value from one of said volumes using values obtained from another volume along the same beam.

38. The method of Claim 34, wherein said calibrating comprises automatically entering information, and manually entering information.

39. The method of Claim 33, wherein said translating comprise computing a mass concentration of solid $M_{(r)}$ per unit volume at a range r according to the formula:

$$\mathrm{Log}_{10}M_{(r)}=K_s+S[dB+2r(a_w+a_s)]$$

wherein K_s is a site and instrument constant,

S is a relative backscattered coefficient defining the relationship between solid concentration and particle size,

dB is the measured relative backscattered

intensity,

a_w is a water attentuation coefficient, and

a_s is an attenuation coefficient due to the presence of solids.

40. The method of Claim 39, wherein said translating further comprise:

using M_r values obtained in connection with one of said volumes to compute said attenuation coefficient a_s; and

imputing said a_s value in translating said intensity value into an M(r) value for the next of said volume farther away from said transmitter.